

Amendments to the Claims

The following Listing of Claims replaces all prior versions of listings of claims.

Listing of Claims

1. (Withdrawn) A heater, comprising:

a mount plate on which a substrate or a jig holding the substrate is loaded;

an opening formed on the mount plate, which is covered by placing the substrate or the jig; and

a heating device for applying heat by blowing hot air to a bottom side of the substrate or the jig through the opening.
2. (Withdrawn) The heater as claimed in claim 1, wherein a hot-air circulation path is provided for returning the hot air blown to the substrate or the jig to the heating device side.
3. (Withdrawn) The heater as claimed in claim 1, wherein a thermostat device for controlling a temperature of the substrate is provided at a position above the mount plate.
4. (Withdrawn) The heater as claimed in claim 3, wherein the thermostat device comprises a radiation plate for heating the substrate by radiant heat and a heating section for heating the radiation plate.
5. (Withdrawn) The heater as claimed in claim 3, wherein the thermostat device comprises a heat absorbing plate for depriving heat of the substrate and an endothermic section for cooling the heat absorbing plate.
6. (Withdrawn) The heater as claimed in claim 1, wherein a holding mechanism is provided for securing the substrate or the jig to the mount plate.
7. (Withdrawn) The heater as claimed in claim 1, wherein the jig is a container for holding the substrate by immersing it in a liquid solder composition.

8. (Withdrawn) A reflow apparatus, comprising:

at least one preliminary heating section for preheating a substrate or a jig holding the substrate;

at least one reflow section for performing main-heating on the preheated substrate or jig;
and

a transporting mechanism for transporting the substrate or the jig through the preliminary heating section and the reflow section, wherein

the preliminary heating section and the reflow section comprise:

a mount plate on which a substrate or a jig holding the substrate is loaded;

an opening formed on the mount plate, which is covered by placing the substrate or the jig; and

a heating device for applying heat by blowing hot air to a bottom side of the substrate or the jig through the opening.

9. (Withdrawn) The reflow apparatus as claimed in claim 8, wherein a hot-air circulation path is provided for returning the hot air blown to the substrate or the jig to the heating device side.

10. (Withdrawn) The reflow apparatus as claimed in claim 8, wherein a thermostat device for controlling a temperature of the substrate is provided at a position above the mount plate.

11. (Withdrawn) The reflow apparatus as claimed in claim 10, wherein the thermostat device comprises a radiation plate for heating a solder composition by radiant heat and a heating section for heating the radiation plate.

12. (Withdrawn) The reflow apparatus as claimed in claim 10, wherein the thermostat device comprises a heat absorbing plate for depriving heat of a solder composition and an endothermic section for cooling the heat absorbing plate.

13. (Withdrawn) The reflow apparatus as claimed in claim 8, wherein a holding mechanism is provided for securing the substrate or the jig to the mount plate.

14. (Withdrawn) The reflow apparatus as claimed in claim 8, wherein the jig is a container for holding the substrate by immersing it in a liquid solder composition.

15. (Withdrawn) The reflow apparatus as claimed in claim 8, wherein at least one cooling section for annealing the substrate or the jig is provided in addition to the preliminary heating section and the reflow section.

16. (Withdrawn) The reflow apparatus as claimed in claim 15, wherein:

the preliminary heating section, the reflow section, and the cooling section are arranged on a concentric circle; and

the transporting mechanism brings in and out the substrate or the jig to/from the preliminary heating section, the reflow section, and the cooling section by a rotary motion.

17. (Withdrawn) The reflow apparatus as claimed in claim 8, wherein the transporting mechanism comprises a vertical motion mechanism for loading and detaching the substrate or the jig on/from the mount plate through moving it up and down.

18. (Withdrawn) The reflow apparatus as claimed in claim 8, wherein the heating device comprises a function of stopping supply of hot air when the substrate or the jig is not placed on the mount plate.

19. (Withdrawn) The reflow apparatus as claimed in claim 16, wherein the transporting mechanism feeds the substrate or the jig successively to the preliminary heating section and the reflow section.

20. (Withdrawn) The reflow apparatus as claimed in claim 19, wherein the transporting mechanism feeds the substrate or the jig by mixing a dummy work.

21. (Previously Presented) A solder bump forming apparatus for forming a solder bump through heating and reflowing a solder composition on a substrate where a plurality of pad electrodes are provided, wherein:

the solder composition is made of a mixture of solder particles and a liquid material that contains a flux component, which becomes liquid at a normal temperature or when heated; and

a heating device is provided for heating the solder composite from a first side of the substrate; and

a thermostat device for controlling a temperature of the solder composition is provided at a position above a mount plate, which is located over a second side of the substrate, wherein the thermostat device includes a system in which the cool air or hot air of the thermostat device does not directly come in contact with the solder composition on the substrate.

22. (Canceled)

23. (Previously Presented) The solder bump forming apparatus as claimed in claim 21, wherein the thermostat device comprises a radiation plate for heating the solder composition by radiant heat and a heating section for heating the radiation plate.

24. (Previously Presented) The solder bump forming apparatus as claimed in claim 21, wherein the thermostat device comprises a heat absorbing plate for depriving heat of the solder composition and an endothermic section for cooling the heat absorbing plate.

25. (Original) The solder bump forming apparatus as claimed in claim 21, wherein the heating device applies heat by blowing hot air to a bottom side of the substrate.

26. (Original) The solder bump forming apparatus as claimed in claim 21, wherein the heating device heats a bottom side of the substrate by thermal conduction.

27. (Original) The solder bump forming apparatus as claimed in claim 21, wherein:

the substrate is immersed in the solder composition within a container; and

the heating device heats the solder composition from the substrate side through the container.

28. (Withdrawn) A solder bump forming method, comprising the steps of:

an application step for depositing, in layers, a solder composition, which is made of a mixture of solder particles and a liquid material that contains a flux component and becomes liquid at a normal temperature or when heated, on a substrate comprising a plurality of pad electrodes; and

a reflow step for reflowing the solder composition through heating it from the substrate side.

29. (Withdrawn) The solder bump forming method as claimed in claim 28, wherein, in the application step, the solder composition is deposited all over a face including the plurality of pad electrodes and gaps therebetween.

30. (Withdrawn) The solder bump forming method as claimed in claim 28, wherein, in the reflow step, the solder composition is heated with a temperature difference provided between heating temperatures on a top-face side and a substrate side of the solder composition.

31. (Withdrawn) The solder bump forming method as claimed in claim 28, wherein, in the reflow step, the solder composition is heated with almost same temperatures for a top-face side and a substrate side of the solder composition.

32. (Withdrawn) The solder bump forming method as claimed in claim 28, wherein, in the reflow step, the pad electrodes are heated to a melting point of the solder particles or higher for melting the solder particles that are in contact with the pad electrodes so as to form a solder coating wet and spread over the pad electrodes and, moreover, the solder particles are united further with the solder coating.

33. (Withdrawn) The solder bump forming method as claimed in claim 28, wherein, in the reflow step, the solder particles closer to the substrate side are precipitated first by providing a temperature difference such that a heating temperature of the solder composition on a substrate side becomes higher than a heating temperature on a top-face side thereof.

34. (Withdrawn) The solder bump forming method as claimed in claim 28, wherein, in the reflow step, precipitation of the solder particles is accelerated with convection by generating the convection in the liquid material through providing a temperature difference such that a heating temperature of the solder composition on a substrate side becomes higher than a heating temperature on a top-face side thereof.

35. (Withdrawn) The solder bump forming method as claimed in claim 28, wherein, in the reflow step, heat is applied while the substrate is immersed in the solder composition within a container.